

# Terms of Reference for the NAFEMS Computational Electromagnetic Working Group

## 1 TECHNICAL AREA COVERED BY THE GROUP

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The NAFEMS Computational ElectroMagnetic Working Group (CEMWG) is concerned with all aspects of Computational ElectroMagnetics (CEM) including any kind of electric and magnetic interaction with physical objects, human beings and the environment. All CEM computational approaches and the related technologies required whether for pre-processing, solving, post-processing (including operational and system level performance evaluation) are of interest to the working group.

The CEMWG is interested in the entire Electromagnetic EM spectrum from static to quantum frequencies. Due to the breadth of the CEM landscape, focus groups may be formed to take ownership of activities relating to a particular application, numerical method or frequency range.

Given the wide range of applications and multiple (time and space) scales involved in CEM simulation, hybridization, coupling techniques and co-simulation are of interest to the group.

Typical methods and applications that are of interest to the CEMWG can be found in Appendix 1.

The group is composed of industrial end users, academics, consultants and simulation tool vendors. The CEMWG is a vendor agnostic, advocate for the use of CEM technology. The strength of output produced by the CEMWG is that it has been scoped and peer reviewed by the working group members.

## 2 AIMS

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To promote the safe, reliable and effective use of CEM by:

1. Providing best practice guidance and information for CEM users of all levels.
2. Encouraging and supporting the increasing use of CEM within the international community.
3. To help both users and managers to apply CEM techniques appropriately and usefully.
4. To provide information for people using information from CEM simulations but who may not be performing simulations directly.

The focus is to improve the effective use of CEM for any industrial applications (aerospace, automotive, defence, biomedical, Internet of Things, telecommunications) regardless of where those simulations are performed (in industry, by consultants or vendors or in academia).

## 3 THE COMPUTATIONAL ELECTROMAGNETIC WORKING GROUPS (CEMWG)

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The CEMWG is composed of experts in the area of CEM who contribute their time and knowledge on a voluntary basis. Members of the CEMWG are responsible for identifying the outputs, directing and contributing to the activities of the working group.

The outputs of the CEMWG are created by current working group members or by external experts from the wider community. Where an output is produced by an external expert, the CEMWG is responsible for ensuring that the output is technically accurate and relevant to the NAFEMS membership.

Due to the breadth of the CEM technical area, at the discretion of the CEMWG, focus groups may be formed to address a specific application area/numerical method.

## 4 CEMWG BYLAWS

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### 4.1 CEMWG MEMBERS

- Members of the CEMWG are listed on meeting minutes as present, contributing or sent apologies.
- If a member of the CEMWG does not contribute for more than 9 months, they will be warned that their membership of the working group may be terminated. An individual's membership of the CEMWG may be terminated after 12 months of non-contribution, at the discretion of the Chair.
- At least two-thirds of the CEMWG shall have active membership with NAFEMS.
- At the discretion of the CEMWG Chair, participation in a working group meeting may be represented by one of two or three individuals from the member organization to reduce the workload on individuals.
- The number of members on the CEMWG should ideally range from between 15-30.

### 4.2 JOINING THE CEMWG

- Potential new members should submit a curriculum vitae to the NAFEMS Technical Working Group Manager (TWGM) indicating their knowledge and experience in the area of CEM. This will be reviewed by the working group and if approved, the person will be invited to attend meetings and participate in the group's activities. It is expected that CEMWG members will hold a senior technical position and have significant expertise in the area of CEM.

### 4.3 MEETING LOGISTICS

- Minutes will be taken for all meetings and actions will be identified. The minutes should be circulated within a month (ideally less) of a meeting date. The TWGM will produce the meeting minutes unless another meeting attendee is selected by the Chair.

- The primary method of meeting will be via a web-based platform to enable international involvement in the group. The CEMWG is also encouraged to take advantage of major NAFEMS or industry events to meet in person. Where a physical meeting is scheduled attempts should be made to provide a web-based connection to the meeting to allow participation of those who are not able to attend the meeting in person.
- The CEMWG should aim to meet at least 6 times a year.

#### 4.4 LEADERSHIP ROLES

- The positions of Chair and Vice-Chair are open for review every three years on the anniversary of the initial appointment. There is no requirement for the role to be rotated. Only current members of the CEMWG may vote or be nominated as Chair. The responsibilities of the CEMWG Chair are defined in Section 10.
- The Chair of the CEMWG should ideally be an industrial user of CEM technology.

#### 4.5 DECISION MAKING

- Where a vote is required it will be carried out via email to the Chair or, if the position of Chair is being voted on, to the TWGM.
- Only current members of the CEMWG are allowed to vote. Each organisation that has a representative in the working group will have one vote. If an organisation has more than one person participating in the working group, the vote will be shared between the participants.
- If required, the casting vote will be held by the Chair.

#### 4.6 COMMUNICATION

CEMWG communication should generally be carried out using the group email address [cemwg@nafems.org](mailto:cemwg@nafems.org). It is the responsibility of the NAFEMS TWGM to ensure that the CEMWG email distribution list is current. Personal distribution lists are discouraged as they require constant updates.

## 5 MEASURES OF SUCCESS

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The success of the CEMWG will be measured in terms of:

- CEMWG Outputs include but are not limited to:
  - Publications
  - Webinars
  - “How to..” Guides
  - Training Courses
- CEMWG Activity & Engagement including but not limited to:
  - Number of CEMWG meetings
  - Number of attendees per meeting
  - % of CEMWG members who attended zero meetings in the last 12 months

- Number of individual leaving the group
- Number of new membership enquiries

## 6 RESOURCE REQUIREMENTS

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The group is administered by the NAFEMS Technical Working Group Manager (TWGM).

Logistical support for the group, consisting of providing a web-based meeting platform, scheduling meetings and web-hosting of working group output is provided by NAFEMS.

Funding is available from NAFEMS to support the development of working group outputs. This funding can take the form of contracts for authors, contracts for the individuals tasked with reviewing. Applications for funding should be made to the NAFEMS Technical Officer.

## 7 DURATION

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The CEMWG will continue in perpetuity until terminated by the NAFEMS CEO.

## 8 ROLES & RESPONSIBILITIES

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### **CEMWG Members**

Responsible for:

- identifying the outputs and directing the activities of the working group
- ensuring that CEM output is technically accurate and relevant to the NAFEMS membership
- regularly contributing to CEMWG activities. Contributions can include:
  - attending and actively participating in working group meetings;
  - participating in topic discussions and activities between meetings, whether individually or as part of a focus team;
  - sending relevant comments or reports on agenda items to the Chair in good time for the meeting;
  - volunteering for and carrying out actions arising from the meetings including developing outputs, reviewing CEM resources, authoring invitations to tender etc.

### **CEMWG Chair**

Responsible for:

- providing leadership to the CEMWG
- acting as the focal point of the CEMWG
- ensuring that CEMWG meetings are run effectively.

### **CEMWG Vice Chair**

Responsible for:

- providing leadership to the CEMWG
- chairing CEMWG in the absence of the Chair.
- supporting the CEMWG Chair.

### **NAFEMS Technical Working Group Manager**



Responsible for:

- acting as the primary point of contact between the CEMWG and NAFEMS
- CEMWG meeting logistics, processing new member requests
- producing the minutes for CEMWG meetings

**NAFEMS Technical Officer**

Responsible for:

- acting as the NAFEMS point of contact for CEMWG funding
- acting as the NAFEMS point of contact for approving CEMWG output

**NAFEMS CEO**

Responsible for:

- providing the authority to terminate or request a change of scope for the CEMWG

**Revision History**

<u>Date</u>	<u>Revision</u>	<u>Description</u>	<u>Author</u>
	1.0	Initial Draft	Ian Symington
02/11/2020	2.0	For Approval by CEMWG	Ian Symington
02/03/2023	2.1	Minor revision to correct an editorial mistake	Ian Symington

# APPENDIX 1

## APPLICATION DOMAINS

- Nanoscale and molecular electrodynamics
- Signal & power Integrity for PCB and cable design
- RF device design:
  - Planar circuit
  - Waveguide components
- Antennas and signal propagation
- Solid and fluid thermodynamics
  - Joule Heating
  - Forming and stirring by Lorentz forces
  - Organic matter interaction
- Electromagnetic Interferences and Crosstalk
- Electrostatic Discharge
- Electric Machines
- Circuit breakers
- Plasma Arcs
- Actuators

## METHODS

- Finite Element Method
- Boundary Element Method
- Method of Moments
- Optical based Methods
- Time Domain
- Frequency Domain

## EM FREQUENCY RANGE OF INTEREST

- Static
- Quasi-static
- Full-wave
- Optical
- Quantum